NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

SPRING DEVELOPMENT
(No.)
CODE 574

DEFINITION

Utilizing springs and seeps to provide water for a conservation need.

PURPOSES

This practice may be applied as part of a resource management system to support one or more of the following purposes:

- Improve the distribution of water;
- Increase the quantity and improve the quality of water for livestock, wildlife, or other uses;
- Obtain water for irrigation if water is available in a suitable quantity and quality.

CONDITIONS WHERE PRACTICE APPLIES

In areas where spring or seep development will provide a dependable supply of suitable water for the planned times of use, and where the intended purpose can be achieved by using this practice alone or combined with other conservation practices.

This standard includes the drilling of horizontal wells into water-bearing formations.

CRITERIA

General Criteria Applicable to All Purposes

Spring developments shall be planned, designed, and constructed in compliance with Federal, Tribal, State, and Local laws and regulations.

Impacts to existing wetland functions shall be assessed. USDA wetland conservation provisions apply. The practice must comply with NRCS wetland technical assistance policy contained in the General Manual, GM 190 (Ecological Sciences), Part 410.26 (Compliance with NEPA- Protection of Wetlands; online at http://policy.nrcs.usda.gov/scripts/lpsiis.dll/GM/GM_190_410_b.htm).

An investigation of site conditions, including soil borings, shall be made. Water quality shall be determined to extent required for the intended purpose. Water quantity shall be measured from existing flows, as practicable when needed, to determine if the development will meet requirements.

Fractured or tubular springs - This type of spring is associated with cavernous rock. If water issues from rock fractures, the individual openings shall be cleaned and enlarged, as needed, to improve flow. The water from these individual openings shall be collected by means of tile or perforated pipeline, or by a gravel-filled ditch. The collection works shall be constructed an adequate distance below the elevation of the openings to permit free discharge.

If water issues from a single opening, such as a solution channel in a soluble rock formation or a tunnel in lava, the opening shall be cleaned or enlarged as needed. A collection system usually is not required.

Perched or contact springs - Perched or contact springs occur where an impermeable layer lies beneath a water-bearing permeable layer. Collection trenches shall be used to intercept and divert flows from the water-bearing formation.

Artesian springs - Artesian springs normally occur at a fissure or break in the impervious stratum, with the water source being an underlying pervious water-bearing layer so positioned that the water surface elevation (water table) is always above the outlet point of the spring.

Remove obstructions, clean or enlarge joints or fractures, or lower the outlet elevation as needed to improve flow. Sumps or spring boxes shall be located as needed. Free outlet discharge or minimum restriction to the spring flow is required to protect and maintain yield.

Collection systems - If a collection trench is used, the trench shall be excavated so that it extends into the impervious layer. The minimum length of the trench shall be based on site conditions and pipe length to collect the amount of needed water. The pipe length and area of disturbance shall be kept as small as practical to collect the needed water.

A cutoff wall shall be constructed along the downstream side of the trench, if needed to insure that the flow enters the collection system. The cutoff wall

may be constructed of plastic sheeting, well-tamped clay, masonry, concrete, or other impervious materials.

The collection system shall consist of subsurface drainage tubing or perforated pipe not less than four-inches in diameter, a wood box drain, or other suitable manufactured system. Surrounding the collector with geotextile fabric or a sand-gravel filter is recommended. Cleanouts are recommended for all collection systems.

Crushed rock or gravel backfill, not less than one foot thick, may be used as a collection system if site conditions warrant, in lieu of other materials. Sand, gravel, and crushed rock shall be composed of clean, hard, durable particles.

Spring boxes - Spring boxes, if needed, shall be made of plastic, concrete, or other durable material, with a tight access cover and impervious floor. A "shoebox" type access cover or manhole attachment, with gasket, is recommended for tightness. The floor may be omitted where the underlying material is stable and impervious.

The boxes shall have a minimum cross-sectional area of 1 ½ ft^2, and the floor of the box shall not be less than six inches below the outlet of the collection system.

Spring box overflows, if needed, shall meet the requirements found in NRCS Conservation Practice Standard 614, Watering Facility.

Outlets. The outlet pipe from the spring box shall be placed not less than six inches above the floor, to provide a sediment trap. The spring outlet pipe should be at the same elevation or lower than the collector pipe outlet to prevent reduced spring flow. The intake to the outlet pipe shall be screened as necessary, and installed to the box with a watertight connection.

The outlet pipe must have a positive grade away from the spring box or collection system unless the vent pipe(s) are added to prevent air locks.

The outlet pipe shall have a minimum 1 ¼ inch (3 cm) diameter. In lieu of site-specific spring flow and pipe vent calculations, the outlet pipe shall have the following minimum size based on line grades:

1. 1 ¼ inches inside diameter for line grades greater than 1.0 percent;
2. 1 ½ inches inside diameter for line grades greater than or equal to 0.5 percent but less than or equal to 1.0 percent;
3. Two inches inside diameter for grade lines less than 0.5 percent.

Pipe beyond three feet from the outlet may be sized per applicable criteria in NRCS Conservation Practice Standard 516, Pipeline. Minimum outlet pipe material and strength requirements shall equal those found in NRCS Conservation Practice Standard 616, Pipeline.

Appurtenance Protection - Measures shall be included to protect appurtenances from damage by freezing, flooding, sedimentation, contamination, vehicular traffic, and livestock.

Wildlife Habitat Protection - Spring developments with the potential to jeopardize wetlands, bogs, fens, or other unique ecological sites shall be designed with measures required to maintain the existing habitat, unless acceptable mitigation is provided. A functional assessment will be made at potential spring development areas to determine existing ecological functions and/or potential losses.

Vegetative Establishment - Establishing vegetation on disturbed areas shall be in accordance with NRCS Conservation Practice Standard 342, Critical Area Planting.

Horizontal Wells - A horizontal rotary method of drilling shall be used with recirculating water to remove drill cuttings. The hole shall be drilled on a downward slope of at least four percent (one-half inch drop per foot of length) and have a minimum diameter of 1 ¼ inches.

After water is encountered, the hole shall be cased with standard two-inch pipe drilled a minimum of 18 feet into unconsolidated soil formations (or 2/3 of the total hole length, whichever is less), or a minimum of five feet into tight, consolidated rock formations overlying the water-bearing material. The casing shall be cemented in place by pressure grouting the annular space between the casing and the surrounding soil or rock with a cement slurry for a tight seal. This is done to prevent groundwater losses along the outside of the casing, and to reduce the risk of groundwater contamination. Allow at least 12 hours for the slurry to set before resuming drilling to the desired length.

After a satisfactory supply of water is established, a pipe liner with a minimum diameter of 1 ¼ inches and slots or perforations opposite the water-bearing formation shall be inserted to keep the hole open and to facilitate flow to the outlet.

The horizontal well shall be completed by installing a tee at the end of the casing, and installing an in-line valve for controlling the water flow and a vacuum relief valve to prevent a vacuum from developing in the casing pipe.

CONSIDERATIONS

Potential damage to wetlands, woody cover, and existing wildlife habitat.

Where feasible and appropriate, replant using native vegetation adapted to wet conditions.

Cultural Resources Considerations

NRCS's objective is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice will have any effect on any cultural resources.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

GM 420, Part 401, the California Environmental Handbook and the California Environmental Assessment Worksheet provide guidance on how the NRCS must account for cultural resources. The Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Endangered Species Considerations

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Water Quantity

1. Potential changes in surface water quantity, especially base flow. Factor in the removal of obstructions and vegetation in the spring area;
2. Potential changes in subsurface water supply, including the possibility of declining yields from the project spring as well as other springs or wells that tap the same water source;
3. A shutoff valve and vent system on the spring outlet pipe should be considered for non-water use periods, system shutdown, flow control, and maintenance;
4. Consider using flow controllers/restrictors on pipelines and/or floats on water facilities to reduce water withdrawal from the spring source and/or provide additional water to the overflow area at the spring site.

Water Quality

1. Potential water quality degradation associated with spring development, including increased utilization. Where appropriate, consider measures (such as fencing) to avoid or reduce trampling the spring area by wildlife and/or livestock;
2. Potential temporary degradation of water quality caused by erosion and sedimentation from the area disturbed during construction.

PLANS AND SPECIFICATIONS

Plans and specifications for installing spring developments shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. The drawings and specifications shall show location, collection system details (including pipe size and type), spring box and outlet details, and fencing as applicable. Identify areas that are not to be disturbed.

OPERATION AND MAINTENANCE

The operations and maintenance of the system shall include such items as winter freeze and flooding protection, overflow and valve operations, spring box sediment and debris removal, rodent damage repair, maintaining vegetative cover, providing for outlet stability, and other items as needed.

Operation and maintenance plans for ecologically sensitive sites shall include specific valve installation and operation requirements to protect existing site habitat values.

REFERENCES

USDA-SCS, March 1983, Springs and Wells: National Engineering Handbook, Part 650 (Engineering Field Handbook), Chapter 12.

USDA-NRCS (Idaho), February 2002, Conservation Practice Standard 574, Spring Development, 4 p.

Welchert, W.T., and Freeman, B.N., July 1973, 'Horizontal' Wells: Journal of Range Management, Vol 26, No. 4, pp. 253-256.